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By

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David Caldwell

WP 2103-89 March 1989

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Beyond Boundary Spanning: Managing External Dependence in Product Development Teams

ABSTRACT

Data from 409 members of 45 new product teams in five high-technology companies indicate the existence of four sets of boundary management activities which can be labeled Ambassador, Task Coordinator, Scout, and Guard. These activities are related to the frequency, type, and destination of communications between team members and others. This paper describes these activities and examines the impact of individual and environmental variables on the frequency in which individual team members engage in them.

Introduction

The development of new products is a critical challenge for many organizations. For companies in highly competitive technology-based industries, the issue is not solely the introduction of new products but also how to accelerate the product development process (David, 1984). One popular technique for shortening product development cycles is the use of teams. Teams are recommended as a way to improve coordination within the organization (Hackman & Walton, 1986; Kanter, 1983; Kazanjian & Drazin, 1987) and to speed product development by promoting the closer coupling of organizational functions necessary to move from a sequential to a parallel development process (Van de Ven, 1986). For these advantages to be realized, new product team members must effectively interact with other functional areas and hierarchical levels in the organization. In this paper, we attempt to describe the pattern of activities in which team members engage in dealing with outsiders and identify some of the factors that contribute to the frequency in which individual team members engage in these activities.

Boundary Management in New Product Teams

To be successful, new product teams must obtain information, resources, and support from others, both inside and outside of the organization, use that information to create a viable product, and finally transfer the technology and enthusiasm for the product to those who will bring it to market (Ancona & Caldwell, 1987; Burgelman, 1983; Quinn & Mueller, 1963). This makes the new product team highly dependent upon others, and suggests that an important way of under-

standing the performance of these teams lies in examining how they manage relationships with other groups.

Some previous researchers have partially taken this approach and examined the pattern and flow of scientific communication into R & D teams (Allen, 1984; Ebadi & Dilts, 1986; Ebadi & Utterback, 1984; Katz, 1982; Tushman, 1977, 1979). These studies have documented a relationship between the acquisition and transmission of information by boundary-spanning individuals and performance of the group. For example, greater communication with organizational colleagues outside the group occurred in high performing R & D project teams than in low performing teams (Allen, 1984). Tushman (1979) found that communication in high-performing development teams followed a two-step process, with communication "stars" first obtaining information from outside the group and then translating that information and transmitting it to the group.

Although extremely useful, this research has focused on the importation of technical information into the group and not on the full range of interactions between a team and its environment. A broader conceptualization of boundary activities would include the complete set of activities necessary to build support for the embryonic product, shape the demands of others, and coordinate the product's development with other groups. As Bagozzi (1975) has observed, exchange theory suggests that when a system is characterized by an interconnecting web of relationships, such as those necessary for product development, broad conceptualizations of the boundary management process are useful.

This broad view of boundary activity is much closer to that frequently taken by organization theorists. Those drawing on a resource dependence paradigm, open systems theory, or a strategic management approach view the organization not simply as an adaptor to environmental contingencies, but also as an entity that can mold, enact, and manage its dependence on outsiders (Adams, 1976; Astley & Van de Ven, 1983; Pennings, 1980; Pfeffer, 1972; Van de Ven & Walker, 1984). For example, a more inclusive description of organizational boundary activities was proposed by Adams (1980). He outlined five classes of activities: acquisition of organizational inputs, the disposal of outputs, searching for and collecting information, representing the organization to outsiders, and buffering it from external threat and pressure. Such a typology seems to reflect many of the boundary activities in which a new product team must engage during the product development process.

The first purpose of this study is to describe the range of boundary activities in which new product team members engage. Our general hypothesis is that due to the complexities of the new product team's dependence on other parts of the organization, team members will display complex patterns of boundary activity similar to those of organizations.

Factors Associated With Boundary Activities

The second purpose of this study is to investigate the factors which influence the type and frequency of team member boundary activities. Specifically, we hypothesize that the types and frequency of boundary activities in which individual team members engage will be

influenced by both the nature of the task environment and the characteristics of the individual.

Task Environment Characteristics. Although a great deal of research has chronicled the relationship between environmental conditions and internal team structure (c.f. Gresov, 1988; Tushman & Nadler, 1978; Tushman, 1977, 1979), little work has examined the relationship between the environment of a task group and its external initiatives (see Allen, 1984 as an exception). Further, much of this work has used environmental uncertainty has the sole measure of the conditions a group faces (Gresov, 1988). However, reviews of the research and development and organizational literatures indicate that more specific descriptions of environments are both possible and desirable. For example, uncertainty can be broken down into technical, organizational, and market uncertainty (Abernathy & Clark, 1985; Argote, 1982; Galbraith, 1982). At the organizational level, Aldrich (1979) describes six characteristics of an environment: rich or lean, homogeneous or heterogeneous, stable or unstable, concentrated or dispersed, consensus or dissension, and the extent of turbulence.

These more detailed descriptions of environments are useful in understanding the circumstances in which highly interdependent teams must operate. Partially based on them, we propose a set of characteristics that can influence the particular boundary activities in which product team members engage.

The first task environment characteristic is the extent to which the new product is revolutionary as opposed to an incremental improvement over an existing product. This variable corresponds to technical

uncertainty, or lack of information about how to do the task (Crawford, 1974; Daft & Macintosh, 1981; Houston & Holmes, 1974). As Dewar and Dutton (1986) have observed, different models may be necessary to explain radical and incremental innovations. When the product is revolutionary, the team therefore may need to go outside its borders more frequently to get technical or conceptual assistance than if the product uses a known technology (Brown & Utterback, 1985).

The second variable which may influence the boundary activities of the team members is the experience of the organization in developing similar products or using similar technologies. Low levels of experience correspond to organizational uncertainty, or lack of standard operating procedures and information about cause-effect relationships (Galbraith, 1977; Thompson & Tuden, 1959). When standard operating procedures do not exist, informal boundary activity may be necessary to aid coordination.

The third environmental characteristic that may influence external activity is the extent of competition the new product will face. High levels of competition may reduce the predictability of others in the environment and increase uncertainty (Abernathy & Clark, 1985; Duncan, 1972; Leblebici & Salancik, 1981), thereby prompting team members to broaden their attempts to collect information from others.

The fourth environmental characteristic is the stability of the market for the new product. This is similar to the rate of environmental change (Aldrich (1979). Products developed for stable markets may have larger lives and more predictable development cycles than those developed for changing markets. High rates of change may also focus

the group on external scanning for information that will keep it updated on current trends.

A final environmental variable is the availability of resources to the team. Personnel, budget, and equipment allocations determine whether the team faces a rich or lean environment (Aldrich, 1979). A rich environment, where resources are both abundant and easily available may reduce the necessity of certain boundary activities. Similarly, lean environments may prompt the team to search for resources throughout the organization.

In addition to the specific characteristics of the task environment, we propose a final factor which may influence the pattern of individual boundary activity. Ancona and Caldwell (1987) argue that the demands of the product development task change from: 1) exploring technical ideas and product potential; 2) to exploiting the information and resources the team has garnered and moving to efficient development of the product; 3) to exporting the expertise and enthusiasm for the product to others. The stage of the product development process may pose a specific set of task demands that may shift team member's external communications. Such changes may translate into shifting boundary activities.

Individual Characteristics. We propose that two general classes of individual variables will be related to boundary activities. The first of these is the individual's role in the organization. Following Allen (1970), we propose that formal team leaders will be most likely to engage in boundary management activities. This will be particularly pronounced for those activities that involve dealing with upper

management.

The second class of individual variables relates to the product team member's experience. Taylor (1972) observes that individuals become communication gatekeepers only when they have sufficient experience in the organization and when they are engaged in technical work. We propose a similar hypothesis, namely that individuals with longer experience in the company will display higher levels of boundary activity since these individuals have had more of an opportunity to develop contacts and to understand the corporate culture.

In addition to the years of experience, we propose that boundary activity will be related to the nature of experiences an individual has had over his or her career. Substantial research suggests that similarity in background or personal characteristics influences attraction and frequency of communication (Good & Nelson, 1971; Newcomb, 1961). This suggests that individuals will more frequently interact with people from the same functional area. Based on this reasoning, it is likely that individuals who have had experience in particular functional areas will be more likely to engage in boundary activities than individuals who do not have the same experiences.

A final variable that may influence the boundary activities of an individual is the extent to which that person is integrated into the project. Since individuals are frequently assigned to more than one project or have multiple responsibilities, there is variability in the amount of time people spend on a project. Some people are assigned nearly full time to the project; others have more diverse responsibilities. The amount of time the individual spends on the project

may influence the type of boundary activities in which the individual engages.

Summary and Hypotheses

In summary, this research has two goals. First, we seek to identify the range of boundary activities that new product team members use to manage their dependence on those outside the team's boundaries. Second, we hypothesize that particular task environment and individual variables will be related to the frequency in which product development team members engage in the pattern of boundary activities. More specifically, we hypothesize that when the new product is revolutionary, new to the company, and in a competitive and highly unstable market, individuals will engage in a different pattern of boundary activities than when the product and its market are more stable and predictable. In addition, the stage of the product development process may influence the frequency of boundary activity. Similarly, we hypothesize that individuals who are team leaders, have served on many teams, have substantial experience in the company, spend a large percentage of time on the project, and have experience in functions other than engineering and research will be more active in boundary management than individuals who do not have these characteristics.

Methods

Two separate data collections were undertaken. The first included: 1) set of interviews with 38 new product managers; and 2) logs kept by all members of two teams for a two-week period. The purpose of

these interviews and logs was to derive a reasonably complete set of boundary activities and to provide an initial test of some of the measures used in the second study. The second study involved the leaders and members of 45 new product teams. In the second study questionnaires and interviews were used to investigate the structure of boundary activities and the factors that contribute to them. In addition, all team leaders were interviewed as were senior managers in each company who provided data on product characteristics.

Study 1

Subjects. Thirty-eight leaders of new product teams in seven corporations in the computer, integrated circuit, and analytic instrumentation industries were interviewed. Interviews ranged between one and eight hours, with an average duration of approximately three hours. All of the leaders had at least three years experience in high-technology organizations and all but seven had managed new product teams prior to the one they were currently describing. Six of the leaders were higher level managers who were responsible for multiple teams.

Identification of Boundary Activities. During part of the interview, each leader was asked to describe the interactions that he or his team members had with other individuals outside the new product team. We asked leaders to be as inclusive as possible in their descriptions and to include all forms of communication including meetings, one-on-one discussions, telephone calls, and computer messages. Also noted were those actions aimed at controlling the team's boundary, such as avoiding meeting with others until a par-

ticular decision had been made or preventing outsiders from meeting with the team.

In addition, two teams of seven and eight members respectively, were asked to keep logs of all of their external activities over a two-week period. The logs required members to record all communications with outsiders including the person with whom they communicated, the hierarchical level of that person, his or her functional group, and the purpose of the communication.

Based on an inspection of the interview transcripts and the logs, a set of 24 boundary activities was identified for use in Study 2. These items included actions such as persuading others to support the team, attempting to acquire resources for the team, bringing technical and political information into the group, and keeping progress of the group secret.

Study 2

Subjects. Questionnaires were distributed to new product team members and leaders of forty-five teams in five corporations in the computer, analytic instrumentation, and photographic industries. Of the 450 questionnaires distributed, a total of 409 questionnaires were returned, yielding a response rate of approximately 89 percent. Response rates were approximately equal across the set of companies and the final total of respondents per company varied from 39 to 129. In addition to the data collected by questionnaire, each team leader was interviewed for approximately one hour. The average age of the sample was 38.6 years, 88 percent were male and 75 percent possessed at least a four-year college degree. Approximately 77 percent of the sample

were from the engineering or R & D function; the remaining were spread across manufacturing, marketing, sales and service, and product management.

Measurement of the Boundary Activities. The 24 boundary activities identified in Study 1 were converted to questionnaire items. Respondents were asked to indicate on five-point Likert scales the extent to which they felt each of the items was part their responsibility in dealing with people outside the team.

In addition to reports of boundary responsibilities, data were collected on individual communication with outsiders in other functional and hierarchical areas in order to provide some validation of the boundary activity scores. Individuals indicated the extent to which their time on the project was spent working alone (x = 48.26 percent; s.d. = 28.37), working with others on the team (x = 37.71 percent; s.d. = 26.47). and working on the product with individuals not assigned to the team (x = 13.90 percent; s.d. = 12.02). A second set of communication measures asked the respondent to indicate on an anchored 6-point scale (1 = Not at all; 6 = Several times per day) the frequency with which the person communicated with people in other functional areas including: manufacturing (x = 3.01; s.d. = 1.76), marketing (x = 2.08; s.d. = 1.39), sales and service (x = 1.89; s.d. = 1.20), R & D (x = 2.27; s.d. = 1.35), the top management of R&D (x = 2.07; s.d. = 1.28), top division management (x = 1.59; s.d. = 1.11) and top corporate management (x = 1.30; s.d. = .75).

Measurement of Task Environment Characteristics. During the interviews with the new product team leaders, a number of structured

questions were asked regarding the task environment of the new product team. Team leaders were asked to indicate on a five-point Likert scale the following: 1) the extent to which the product used a revolutionary technology (1 = Same as other products, 5 = revolutionary; x = 3.16, s.d. = 1.10); 2) the experience of the company in developing similar products (1 = Never done it before, 5 = Do it all the time; reversed scoring, x = 3.09, s.d. = 1.47); 3) the amount of external competition the product faces (1 = None, 5 = A great deal; x = 3.99, s.d. = .93); 4) the rate at which the targeted market is changing (1 = Not at all, 5 = very rapidly; x = 3.21, s.d. = .84); 5) the availability of personnel, equipment, and funds (three items are averaged to determine the richness of the environment; 1 = rarely available, 5 = no problem securing; reversed scored, x = 2.17, s.d. = .37).

In addition, the team leader indicated the stage of the product development process. Teams were categorized as being in the creation, development, or diffusion stage of product development (Ancona & Caldwell, 1987). Teams in the creation phase had not yet developed complete product specifications. Teams in the development stage were completing the technical tasks necessary to produce a working prototype. Teams in the diffusion stage had met project specifications and were in the process of transferring the prototype to those who would manufacture and distribute it.

Measurement of the Individual Correlates of Boundary Activity. The questionnaire also contained items regarding individual background and experience. Three of these were the number of new product teams on which the respondent had previously served (x = 9.38, s.d. = 16.30),

the years that the respondent had been with the company (x = 11.23; s.d. = 9.16), and the percentage of their work time which was devoted to the project (x = 59.62 percent; s.d. = 37.98). In addition, respondents indicated whether or not they had experience in R & D, marketing, and manufacturing (0 = no, 1 = yes).

Results

Patterns of Boundary Activities

The first general research question addressed the existence of multiple independent dimensions of boundary activity to deal with the complex set of dependencies that the new product teams faces with other parts of the organization. To investigate this, a principal component analysis with a varimax rotation was performed on the 24 boundary activity items included in the questionnaire. Table 1 summarizes this analysis and shows the item loadings greater than .35.

Insert Table 1 About Here

Although some cross-loading exists, four interpretable factors emerged. The first factor is defined by 12 items with loadings greater than .50. The items appear to reflect primarily buffering and representational activities. Examples of buffering included such things as absorbing pressures and protecting the team. Representational activities included persuading others to support the team, keeping higher levels informed of team activities, informing the team of company

strategy and of potential threats or opposition the team may face, and lobbying for resources. Since these activities contain both protective and persuasive goals, we label the set of behaviors identified by this factor as ambassador activities.

Five items with loadings greater than .50 primarily define the second factor. These items represent interactions aimed at coordinating technical or design issues. We term this activity set, task coordinator. Examples of behaviors in this set include discussing design problems with others, obtaining feedback on the product design, coordinating and negotiating with outsiders.

The third factor is made up of four items with loadings greater than .50. This factor is labelled scout because it describes activities that involve general scanning for ideas and information about the competition, the market, or the technology. While task coordinator activities appear to be aimed at handling specific technical and coordination issues, scout activities appear to incorporate more general scanning.

The fourth set of activities are guard activities. The three items that comprise this factor all involve controlling the team's release of information. Activities here are aimed at keeping information within the team's boundaries in order to protect the team or present a specific image of the team to outsiders.

Further analysis of Boundary Activity

To ensure orthogonality among the four boundary dimensions, factor scores were computed and used in subsequent analyses. As a partial test of the validity of the structure of the boundary activities, and

to learn more about the destinations of the four types of boundary activity, correlations between the individual boundary factor scores and the individual communication variables were calculated. Although not shown as a table, the ambassador factor scores are correlated with frequency of communication with manufacturing ($r = .12$, $p < .05$), marketing ($r = .25$, $p < .001$), top R & D management ($r = .15$, $p < .01$), top division management ($r = .20$, $p < .001$), and top corporate management ($r = .15$, $p < .01$). In contrast, the task coordinator factor was associated with higher levels of communication with manufacturing ($r = .34$, $p < .001$), and R & D below the top management level ($r = .10$, $p < .05$). Individuals with high scores on the scout factor engage in more frequent communication with R & D below the top management level ($r = .10$, $p < .05$), marketing ($r = .29$, $p < .001$) and sales and service ($r = .16$, $p < .01$). The guard factor was unrelated to frequency of communication.

The relationships noted above lend support for the validity of differentiated boundary activity sets. Individuals who believe themselves responsible for protecting the team and representing the team to outsiders have the broadest set of communication links. Those individuals reporting responsibility for technical problem solving and coordination interact with lateral groups particularly manufacturing and R & D, while those who are scanning for competitive, market, and technical ideas, have more frequent interaction with R & D, marketing and sales.

Not only do identified boundary factors relate to the type and destination of their communications, they also relate to how much time

individuals spend working alone on the project, working with other team members on the project, and working with non-members on the project. Ambassador factor scores are negatively related to percentage of time spent alone ($r = -.18$, $p < .001$), but positively related to time spent with team members ($r = .11$, $p < .05$), and outsiders ($r = .14$, $p < .01$). Similarly, task coordinator factor scores are negatively correlated with time spent alone ($r = -.13$, $p < .01$), but positively correlated with time spent with outsiders ($r = .29$. $p < .001$). Scout and guard factor scores are unrelated the amount of time team members spend working with others.

Factors Influencing Boundary Activity

The second goal of this study was to identify the environmental and individual variables that influence the extent to which team members engage in boundary activities. To identify the relationships between boundary activities and the other variables, separate regressions were computed for each of the four, independent boundary activity factors. For each factor, a hierarchical regression model was developed. First, dummy variables representing the companies in the sample were entered into the equation to control for company differences. Second, the five task environment variables were entered: degree to which product is revolutionary (REVOL); experience of the company (EXPER); degree of competition (COMPET); availability of resources (RESAVL); and market stability (MSTABIL). Third, dummy variables representing the phase of the product development process were entered. Finally, the individual variables were entered. These were: whether or not the individual was a team leader (LEADER); the number of teams on

which the individual has served (NUMTEAMS); years of experience in the company (YEARSCO); the percentage of time the individual spends working on the project (PCTPROJ) and whether or not the individual has experience in R & D (EXRD); manufacturing (EXMFG); or marketing (EXMKT). Following the entry of each set of variables, the incremental increase in the variance explained was examined.

Table 2 shows the correlation matrix for all variables in the regressions and Table 3 shows the regression results. As shown, the complete set of variables explain significant amounts of the variance in all four of the boundary activity factors. Looking at each set of variables, a number of findings are worthy of note.

Insert Tables 2 and 3 About Here

First, the dummy variables indexing the company explained significant variance on both the ambassador and guard factor. This suggests that particular corporate environments may encourage certain external activities more than others.

Second, task environment variables do not seem to have a large impact on boundary activity. The exception here is with regard to resource availability. In lean environments (low resource availability) individuals display higher levels of scout activity and lower levels of guard activity, than in rich environments.

Third, the phase of the project is related to the level of activity on the ambassador dimension. Although not shown here, an inspection of ambassador activity across the three stages of the

product development process suggests that such activity is highest during the creation and diffusion stage, and lower during the development stage.

Finally, the individual variables have a significant impact on all four factors. Whether or not an individual is a team leader is strongly related the extent to which the individual assumes responsibility for both ambassador and task coordinator activities. Longer tenure in the organization is related to reported responsibility for task coordinator activities, while the percentage of work time committed to the team is positively related to responsibility for guard activities. Finally, there appears to be support for the hypothesis that similarity in background and experience is related to frequency and type of communication. Experience in manufacturing suggests high levels of task coordinator but low level of scout activity while experience in marketing suggests high levels of ambassador and scout activity, but low levels of task coordinator activity.

Discussion

Despite the increasing emphasis on the use of teams in facilitating product development, there is little concrete evidence regarding how particular team activities or structures can enhance the product development process. In this study we have concentrated on identifying the pattern of cross-boundary activities a team uses to manage its dependence on other parts of the organization. Our goal was to move beyond examining the frequency of external communication in order to

describe the varied types of communication needed to handle complex interdependence. Several findings from this research may be useful in understanding and improving new product team performance.

First, the data suggest that the boundary activities of new product teams are multi-faceted and complex. Boundary spanning goes beyond the importation of technical information and includes handling a broad range of inputs and outputs, as well as functions such as protecting the team and representing the team to others. This model of boundary spanning is much closer to that taken by organization theorists than group researchers. More specifically, teams attempt not only to exchange technical information but also to model the environment of the organization, facilitate coordination with other organizational units, and to mold the views, expectations and behaviors of those who control critical resources.

From the resource dependence perspective, the most critical determinant of an entity's viability is the ability to obtain critical resources (Astley & Van de Ven, 1983; Pfeffer & Salancik, 1978). Our expanded view of boundary spanning suggests that technical know-how is only one critical resource for new product teams. In addition to existing in a technological environment, teams belong to an organizational environment in which there is competition for time, money, personnel, influence, support and information. Team members in this study worked to obtain these organizational resources, while simultaneously protecting other team members who could then concentrate on the core technical work. Clearly, the management of this broader organizational dependence needs to be added to that of technological

dependence in order to understand the requirements of boundary spanning. In fact, as global competition grows and authority within the organization gets pushed down the hierarchy, functional groups must work more closely together (Galbraith, 1982; Malone, 1987). This means that the management of this organizational dependence may well become increasingly important.

Second, the data indicate that different types of boundary activities are needed for different types of dependence. Vertical or hierarchical dependence (Gresov, 1988), whereby top levels of the organization distribute personnel, funding, equipment, legitimacy, and priority, is handled through ambassador activity. Ambassador activity appears to be somewhat political; identifying threat and opposition in top levels of the organization and working to build support from these powerful outsiders. Horizontal or lateral dependence, whereby other functions have critical information, expertise, and creative ideas, is harnessed through task coordinator and scout activity. Task coordinator activity is the most time-consuming, requiring the largest amount of time devoted to external, as opposed to internal, activities. Coordination and synchronization with other technical groups appears to require more focused communication than the more general scanning done through scout activities. Scout activities aimed at obtaining competitive, market, and technical ideas illustrate yet a third set of behaviors, aimed at a different part of the organization (those with access to information about external competitive trends), to handle a second form of lateral dependence. In contrast, guard activities represent a means of decreasing, rather than meeting, dependence

through the control of information flow out of the group.

Third, the findings indicate that team members do not vary their boundary activities based on characteristics of the task environment. One clear exception to this is the response to resource scarcity--yet even here teams respond through an increased openness in boundary permeability (scouting allows for information to flow into the group while low guard activity means that information also flows out of the group) and not the predicted ambassador activity aimed at obtaining resources. Future research will need to determine whether this lack of adaptation of boundary activity to environmental conditions is detrimental to team performance, or whether the teams in this sample are already exhibiting high levels of boundary activity to deal with organizational dependence and thus task environment demands are also met.

Finally, the data suggest that individual characteristics are important in understanding who assumes boundary activity. Not surprisingly, leaders display higher levels of some important activities -- ambassador and task coordinator -- than non-leaders. In addition, functional experiences facilitate particular boundary activities and inhibit others. Those with current or previous experience in marketing are prone to take on scout activities, scanning and obtaining ideas from sales, marketing, and lower levels of R & D, yet shy away from task coordinator activities with R & D and manufacturing. The opposite holds for those with current or previous experience in manufacturing and to some extent R & D. Clearly, experience, knowledge, and comfort with the language, values, and priorities of another function or

"thought-world" (Dougherty, 1987) facilitates communication with those similar others. These findings suggest that training for new product team members and leaders should focus on gaining cross-functional experience and obtaining skills in a wide range of external boundary activities.

In short, we have identified a set of activities beyond technological boundary spanning: ambassador, task coordinator, scout, and guard activities. This broad range of activities suggests that new product team members, and members of other externally-dependent groups, must learn to manage a complex set of organizational, as well as, technological dependencies. We look to future researchers to test the validity and generalizability of our findings, and the relationship between boundary spanning and key outcome variables such as performance, development, and innovation.

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TABLE 1

VARIMAX FACTOR LOADINGS FOR BOUNDARY MANAGEMENT DIMENSIONS
n=409

	1	2	3	4
Absorb outside pressures for the team so it can work free of interference.	.785			
Protect the team from outside interference.	.740			
Prevent outsiders from "overloading" the team with too much information or too many requests.	.719			
Persuade other individuals that the team's activities are important.	.654			
Scan the environment inside your organization for threats to the product team.	.636		.417	
"Talk up" the team to outsiders.	.602			
Persuade others to support the team's decisions	.592	.416		
Acquire resources (e.g. money, new members, equipment) for the team.	.587	.417		
Report the progress of the team to a higher organizational level.	.553	.403		
Find out whether others in the company support or oppose your team's activities.	.551		.449	
Find out information on your company's strategy or political situation that may affect the project.	.549		.430	
Keep other groups in the company informed of your team's activities.	.519	.421		
Resolve design problems with external groups.		.776		
Coordinate activities with external groups.		.660		
Procure things which the team needs from other groups or individuals in the company.		.657		
Negotiate with others for delivery deadlines.		.618		

Review product design with outsiders.	.515	.404	
Find out what competing firms or groups are doing on similar projects.		.791	
Scan the environment, inside or outside the organization for marketing ideas/expertise.		.719	
Collect technical information/ideas from individuals outside of the team.	.424	.645	
Scan the environment inside or outside the organization for technical ideas/expertise.	.491	.587	
Keep news about the team secret from others in the company until the appropriate time.			.823
Avoid releasing information to others in the company to protect the team's image or product it is working on.			.817
Control the release of information from the team in an effort to present the profile we want to show.			.592

TABLE 2:

CORRELATION MATRIX OF BOUNDARY FACTOR SCORES, TASK ENVIRONMENT VARIABLES; AND INDIVIDUAL CHARACTERISTICS

N=409

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. AMBASS	-	-	-	-											
2. T.C.	-	-	-	-											
3. SCOUT	-	-	-	-											
4. GUARD	-	-	-	-											
5. REVOL	-.06	.03	-.08	.05	-										
6. EXPER	-.04	-.00	-.09 *	.07	.56 ***	-									
7. COMPET	-.05	.05	.08 *	.01	-.36 ***	-.35 ***	-								
8. RESAVL	.03	-.02	.13 **	-.16 ***	-.53 ***	-.44 ***	.33 ***	-							
9. MSTABIL	.06	.03	-.06	.02	-.11 **	.13 **	-.03	-.21 ***	-						
10. LEADER	.46 ***	.17 ***	.00	-.11 *	-.04	.02	.03	.10 *	-.01	-					
11. NUMTEAMS	.09 *	.10 *	-.08	-.08	-.01	-.03	-.05	.07	.06	.08	-				
12. YEARSCO	-.05	.12 **	-.02	-.02	-.10 *	-.18 ***	.09 *	.17 ***	-.08	.04	.25 ***	-			
13. PCTPROJ	.01	-.00	.03	.18 ***	.30 ***	.25 ***	-.02	-.32 ***	.06	.02	-.21 ***	-.27 ***	-		
14. EXRD	.01	.07	-.00	.06	.05	.08	-.03	.04	.03	.12 **	-.03	-.06	.31 ***	-	
15. EXMFG	-.04	.13 **	-.15 **	-.02	-.01	-.02	-.16 ***	-.02	.05	-.11 **	.21 ***	.17 ***	-.27 ***	-.23 ***	-
16. EXMKT	.18 ***	-.13 **	-.17 ***	-.07	.04	-.02	-.19 ***	.01	-.04	.07	.10 *	.04	-.10 *	-.04	.30 ***

***P .001 **P .01 *P .05

TABLE 3

REGRESSION RESULTS+
n=409

	Boundary Factors			
	1	2	3	4
	Ambassador	Task Coordinator	Scout	Guard
Company				
Dummy 1	-.20**	-.01	.04	.14*
Dummy 2	-.16*	-.12	-.07	-.07
Dummy 3	.23**	.00	.01	-.04
Dummy 4	.03	.13	.10	.12
Adjusted R Square	.04	.00	.00	.02
F	5.03***	1.31	.59	2.97*
Task Environment				
REVOL	-.02	.06	-.02	.07
EXPER	-.06	-.01	-.02	-.06
COMPET	-.12*	.06	.05	.02
RESAVL	.08	.02	.13*	-.22**
MSTABIL	.05	.05	-.04	-.02
Adjusted R Square	.05	.00	.01	.05
F	3.06**	.79	1.40	2.92**
E-R Square Change	1.46	.38	2.04*	2.82*
Phase				
Dummy 5	-.05	.02	.01	-.05
Dummy 6	.19**	.06	-.05	.06
Adjusted R Square	.06	.00	.01	.04
F	3.23***	.81	1.19	2.43**
F-R Square Change	3.79*	.89	.28	.29
Individual				
LEADER	.43***	.20***	-.04	-.10
NUMTEAMS	.06	.02	-.07	.04
YEARSCO	-.01	.12*	-.01	.03
PETPROJ	.00	.00	-.03	.18**
EXRD	-.08	.09	-.03	.01
EXMFG	-.07	.22***	-.21***	.02
EXMKT	.14*	-.24**	.25***	-.01
Adjusted R Square	.26	.10	.07	.06
F	7.86***	3.03***	2.42***	2.35***
F-R Square Change	13.00***	5.95***	4.23***	2.15*

+ Entries are standardized regression coefficients
* $p<.05$ ** $p<.01$ *** $p<.001$

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